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LIPOPHILIC PROFILE OF EXTRACTABLE FAT FROM NUTMEG *MYRISTICA FRAGRANS* L.

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ABSTRACT

A simple scheme for extraction of nutmeg fat from nutmeg *Myristica fragrans* L is described. The variation in this fat was 24-30% in the accessions evaluated. Thin layer chromatography of saturated lipids in the fat indicated the presence of mono, di and tripalmitins. The triglyceride content varied from 86.2 to 97.4% within the accessions and may serve as a useful quality index in nutmeg. The other triacylglycerols are found to be absent. The glyco, neutral and phospholipids were found to be 33, 28 and 10% respectively. Large variation is observed in the case of fatty acid profile. The suitability of this fat in perfumery and confectionary is described.

INTRODUCTION

Nutmeg *Myristica fragrans* L is a source of two spices viz. nut and the mace. Analytical characteristics of mace fat (Pishawikar and Pishawikar, 1953) and its lipid composition studies (Prakashchandra and Chandrasekharappa, 1984) confirm its suitability for perfumery. Even though nut is reported to contain 28.35% of solvent/fat, reports about its analytical characteristics and lipophilic profile are scanty. In the present paper a simple scheme for solvent extractable fat is presented and its analytical characteristics and lipid composition are studied.

MATERIALS AND METHODS

Nutmeg nuts were obtained from marked accessions (from CPCRI Research Centre, Kannara) and shade dried, ground fine to pass 40 mesh and fat extracted as per the flow sheet (Fig. 1). For obtaining the total fats hexane extract was desolvent and quantified by gravimetry.

Lipid separation

The chloroform solubles were resolved by stepwise elution into neutral, glyco and phospholipids as per the method of Prakashchandra and Chandrasekharappa (1984) and respective fractions were quantified by gravimetry.

TLC of lipids

Known quantity of nutmeg fat from each accession was dissolved in chloroform alongwith lipid standards containing mono, di and tripalmitins (Sigma Chemicals) in equiproportions on a pre-activated silica gel G (0.25 mm thickness)

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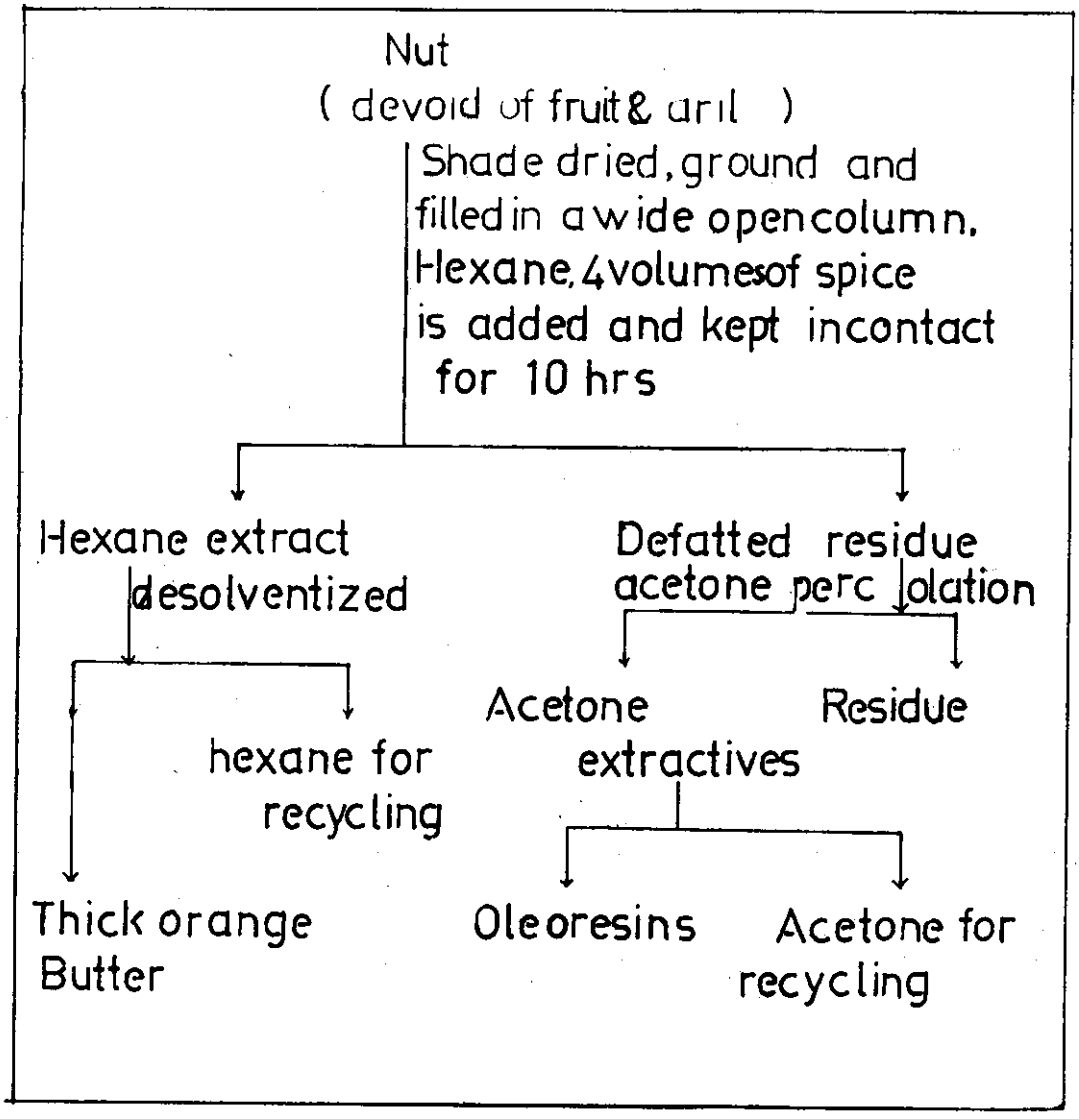

Fig. 1. Flowsheet for the extraction of nutmeg butter and oleoresins

plate and developed in a solvent system containing petroleum ether (60-80°C), diethyl ether and acetic acid (90:10:1 v/v/) and exposed to iodine vapours for visualisation. Another plate was developed and sprayed with 0.5% Bromothymol blue in aqueous ethanol and exposed to ammonia vapour to confirm the above results.

TLC of fatty acids

Fatty acids in nutmeg fat was separated by TLC with a linoleic acid as a marker standard as per the method of Morrison *et al.* (1980).

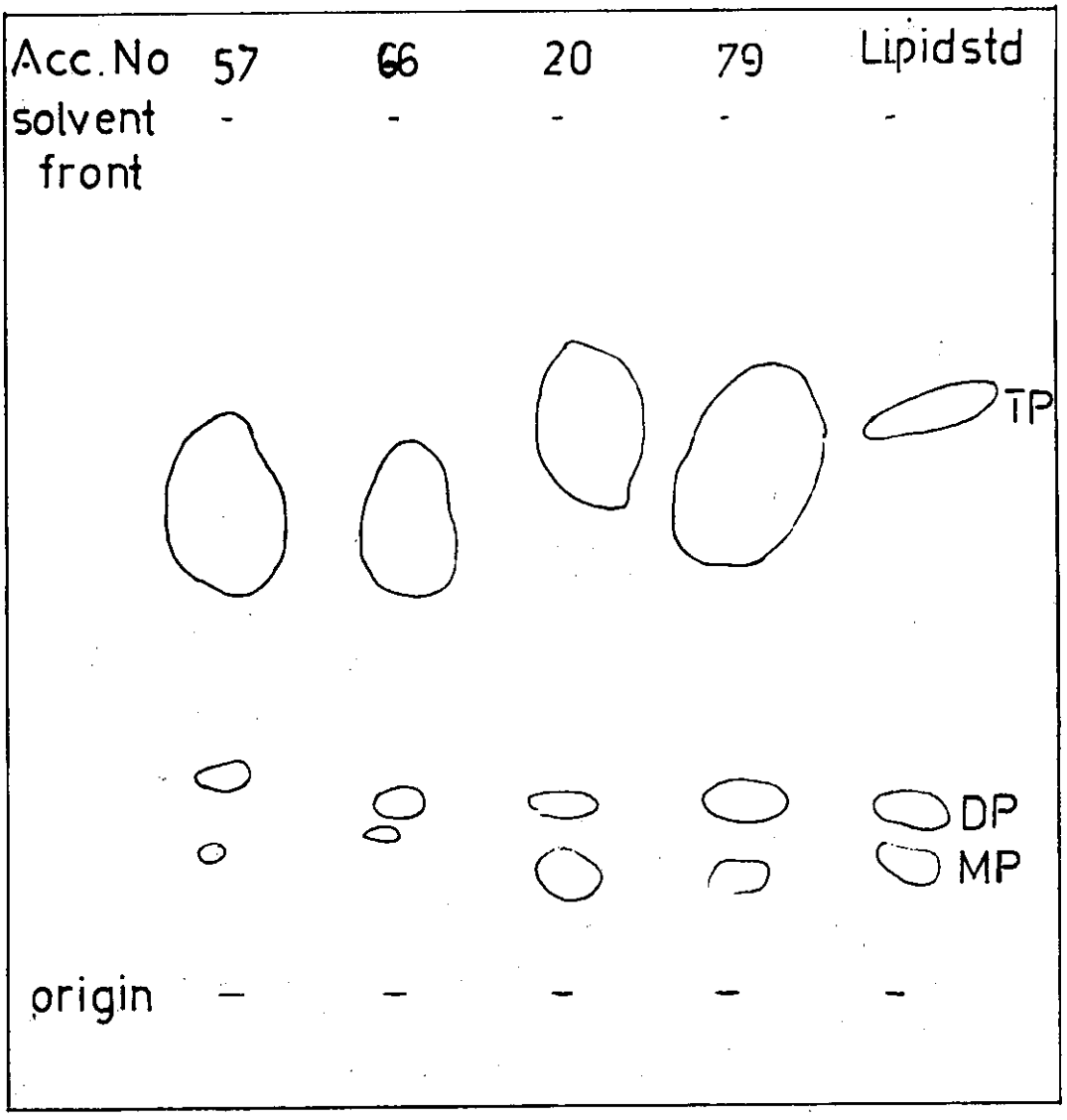

Fig. 2. TLC trace diagram of saturated lipids in Fat extracted from nutmeg solvent system:Pet:ether: Diethylether:Acetic acid 90:19:1(v/v)
TP: Tripalmitin. DP: Dipalmitin.
MP: Monopalmitin

Gas liquid chromatography of fatty acids

GLC of representative sample of the (methylated) fat was accomplished by using Hewlett pachard 5730 A GC interfaced with varian Techtron recorder as per the method of Marta I. Aveldans and Lioyd Horrecks (1983). Individual fatty acids were quantified and presented as the b% total of the acids.

Table I. *Variation in nut weight, total extractable fat and lipid profile in the selected accessions.*

Accession No	Nut weight	%** Fat	Lipid profile		
			Mono	di palmitins	tri
20	17	26.04	0.6	1.9	97.4
57	27	30.50	6.8	6.8	86.2
66	15	24.00	4.7	5.0	89.3
79	13	25.78	0.8	5.4	93.8

*Average of two determinations
**Hexane extraction

RESULTS AND DISCUSSION

A simple scheme for the extraction of nutmeg fat is presented in Fig. 1. It is necessary to use wide open column in place of ordinary glass columns since the hexane extract during the elution blocks the column by the formation of semi solid fat. However, by using a wide open column such a difficulty could be overcome, the extraction of 200 g nut flour yields about 60 g of nutmeg fat. Analysis for the residual solvents in the extractable fat indicate the presence of spice fat only. A wide variation in the total extractable fat was observed in different accessions. Variation in per cent nut weights, extractable fat and lipid profile in selected accession are presented in Table I. It is generally observed that the fat content depends on the per cent nut weight, and varied from 24-30%. A preliminary TLC after dissolving nutmeg fat in chloroform and visualized by iodine vapour exposure has revealed besides fatty acids, some saturated and unsaturated lipids. Hence a selective TLC was conducted for lipids and fatty acids. TLC profile for saturated lipids is presented in Fig. 2. It is observed that alongwith the saturated lipids, the unsaturated counterparts are totally absent, which indicates that rancidity of this fat is negligible. As linear relationship is observed between concentration and the area, the unknown lipids could be extrapolated. Mono, di and triglyceride content in different accessions indicate that triglycerides vary from 86.2 to 97.4 whereas mono and diglycerides vary from 0.6 to 6.8 and 1.9 to 6.8 respectively. Out of three triacyl glycerols only tri-myristicin was present in nutmeg while triolein and tripalmitin were absent.

Fractionation of nutmeg fat, into neutral, glyco and phospholipid resulted in 33% of glycolipids, followed by neutral lipids (28%) and phospholipids (10%). The unaccounted lipid fraction may be a lipoprotein. As neutral lipid portion is considerably high a detailed estimation on the fatty acid composition was taken up to understand the lipophilic profile of this fat.

TLC profile of fatty acids is presented in Fig. 3. Due to the paucity of fatty acid standards, linoleic acid standard alone was co-chromatographed and the unknowns were identified on the basis of Rf values of Morrison *et al.* (1980) and

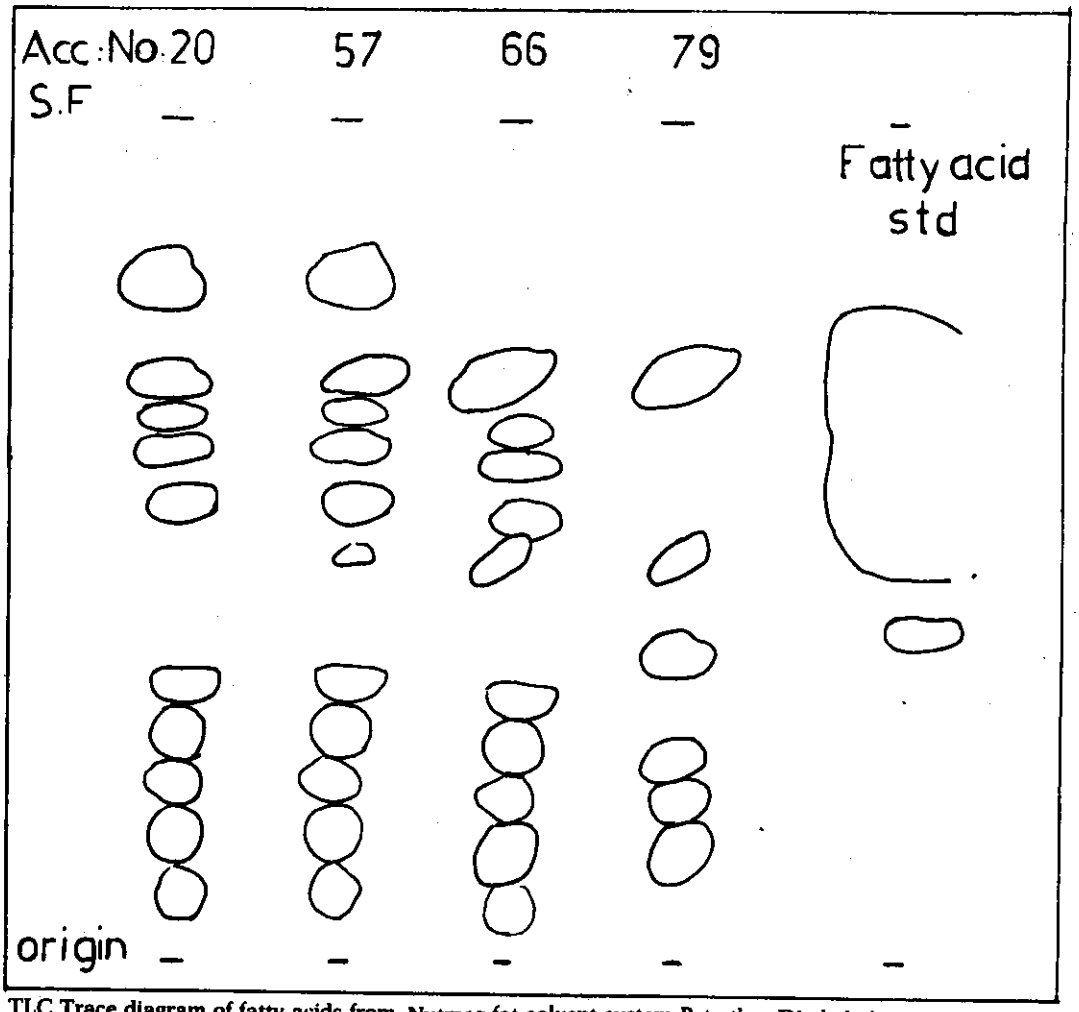

Fig. 3. TLC Trace diagram of fatty acids from Nutmeg fat solvent system: Pet:ether:Diethylether: Acetic acid. 70:30:1(v/v)

Table II. *Variation in % fatty acids in different accessions.*

Fatty acids	% of total fatty acids
Caproic	2.8-3.6
Caprylic	4.2-5.2
Capric	3.6-4.1
Lauric	3.6
Myristic	5.2
Palmitic	2.6-3.6
Stearic	4.1
Oleic	0.2-2.4
Linoleic	4.3-6.7
Linolenic	0.9

presented in Table II. Gas liquid chromatography of the fatty acids, trimethylsilyl derivatives confirm the results of TLC. A typical gas chromatogram is presented in Fig. 4. The acid value and the saponification value of the hexane extractable fat was found to be 8.98 and 196 respectively.

High saponification value and low acid value indicate its suitability in perfumery. Inspite of its easy extractability and

desirable physical and chemical characteristic, reports on the use of this fat either in perfumey or in confectionery are scanty. High glycolipid content (Finlay Macrutchie, 1977) makes the fat desirable for confectionery and low lipolysis of triglycerides (Ahuja *et al.*, 1979) confirm the suitability of this fat for bread making.

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